

CLAIMS:

1. A corrosion resistant rare earth magnet comprising  
a rare earth permanent magnet represented by R-T-M-B  
5 wherein R is at least one rare earth element including  
yttrium, T is iron or a mixture of iron and cobalt, and M is  
at least one element selected from the group consisting of  
Ti, Nb, Al, V, Mn, Sn, Ca, Mg, Pb, Sb, Zn, Si, Zr, Cr, Ni,  
Cu, Ga, Mo, W, and Ta, and the contents of these elements are  
10 in the ranges:  $5 \text{ wt\%} \leq R \leq 40 \text{ wt\%}$ ,  $50 \text{ wt\%} \leq T \leq 90 \text{ wt\%}$ ,  $0 \text{ wt\%} \leq M \leq 8 \text{ wt\%}$ , and  $0.2 \text{ wt\%} \leq B \leq 8 \text{ wt\%}$ , and  
a composite film of flaky fine powder/metal oxide  
formed on a surface of said magnet by treating the surface  
with a treating liquid comprising at least one flaky fine  
15 powder selected from the group consisting of Al, Mg, Ca, Zn,  
Si, Mn, and alloys thereof and at least one metal sol  
selected from the group consisting of Al, Zr, Si, and Ti,  
followed by heating.
- 20 2. A corrosion resistant rare earth magnet according to  
claim 1, wherein said flaky fine powder of which the  
composite film is made consists of particles of a shape  
having an average length of 0.1 to 15  $\mu\text{m}$ , an average  
thickness of 0.01 to 5  $\mu\text{m}$ , and an aspect ratio, given as  
25 average length/average thickness, of at least 2, and the  
flaky fine powder is present in the composite film in an  
amount of at least 40 wt%.
3. A corrosion resistant rare earth magnet according to  
30 claim 1 or 2, wherein said metal sol has been prepared by  
hydrolysis of an alkoxide of a metal selected from the group  
consisting of Al, Zr, Si, and Ti.
4. A method for preparing a corrosion resistant rare  
35 earth magnet, comprising the steps of:

applying a treating liquid comprising at least one flaky fine powder selected from the group consisting of Al, Mg, Ca, Zn, Si, Mn, and alloys thereof and at least one metal sol selected from the group consisting of Al, Zr, Si, and Ti to a surface of a rare earth permanent magnet, said rare earth permanent magnet being represented by R-T-M-B wherein R is at least one rare earth element including yttrium, T is iron or a mixture of iron and cobalt, and M is at least one element selected from the group consisting of Ti, Nb, Al, V, Mn, Sn, Ca, Mg, Pb, Sb, Zn, Si, Zr, Cr, Ni, Cu, Ga, Mo, W, and Ta, and the contents of these elements are in the ranges: 5 wt%  $\leq$  R  $\leq$  40 wt%, 50 wt%  $\leq$  T  $\leq$  90 wt%, 0 wt%  $\leq$  M  $\leq$  8 wt%, and 0.2 wt%  $\leq$  B  $\leq$  8 wt%, and

heating to form a composite film of flaky fine powder/metal oxide on the magnet surface.

5. A method for preparing a corrosion resistant rare earth magnet according to claim 4, further comprising the step of subjecting the rare earth permanent magnet surface to at least one pretreatment selected from pickling, alkaline cleaning and shot blasting, prior to the applying step.

6. A corrosion resistant rare earth magnet comprising a rare earth permanent magnet represented by R-T-M-B wherein R is at least one rare earth element including yttrium, T is iron or a mixture of iron and cobalt, and M is at least one element selected from the group consisting of Ti, Nb, Al, V, Mn, Sn, Ca, Mg, Pb, Sb, Zn, Si, Zr, Cr, Ni, Cu, Ga, Mo, W, and Ta, and the contents of these elements are in the ranges: 5 wt%  $\leq$  R  $\leq$  40 wt%, 50 wt%  $\leq$  T  $\leq$  90 wt%, 0 wt%  $\leq$  M  $\leq$  8 wt%, and 0.2 wt%  $\leq$  B  $\leq$  8 wt%, and

a composite film formed on a surface of said magnet by treating the surface with a treating liquid comprising at least one flaky fine powder selected from the group consisting of Al, Mg, Ca, Zn, Si, Mn, and alloys thereof and

a silane and/or a partial hydrolyzate thereof, followed by heating.

7. A corrosion resistant rare earth magnet according to claim 6, wherein said silane is a trialkoxysilane or dialkoxysilane.

8. A corrosion resistant rare earth magnet according to claim 6 or 7, wherein said flaky fine powder of which the composite film is made consists of particles of a shape having an average length of 0.1 to 15  $\mu\text{m}$ , an average thickness of 0.01 to 5  $\mu\text{m}$ , and an aspect ratio, given as average length/average thickness, of at least 2, and the flaky fine powder is present in the composite film in an amount of at least 40 wt%.

9. A corrosion resistant rare earth magnet according to claim 6, 7 or 8, wherein said composite film has a thickness of 1 to 40  $\mu\text{m}$ .

10. A method for preparing a corrosion resistant rare earth magnet, comprising the steps of:

applying a treating liquid comprising at least one flaky fine powder selected from the group consisting of Al, Mg, Ca, Zn, Si, Mn, and alloys thereof and a silane and/or a partial hydrolyzate thereof to a surface of a rare earth permanent magnet to form a treatment coating of flaky fine powder/silane and/or partially hydrolyzed silane, said rare earth permanent magnet being represented by R-T-M-B wherein R is at least one rare earth element including yttrium, T is iron or a mixture of iron and cobalt, and M is at least one element selected from the group consisting of Ti, Nb, Al, V, Mn, Sn, Ca, Mg, Pb, Sb, Zn, Si, Zr, Cr, Ni, Cu, Ga, Mo, W, and Ta, and the contents of these elements are in the ranges: 5 wt%  $\leq$  R  $\leq$  40 wt%, 50 wt%  $\leq$  T  $\leq$  90 wt%, 0 wt%  $\leq$  M  $\leq$  8 wt%, and 0.2 wt%  $\leq$  B  $\leq$  8 wt%, and

heating the treatment coating to form a composite film on the magnet surface.

11. A method for preparing a corrosion resistant rare earth magnet according to claim 10, further comprising the step of subjecting the rare earth permanent magnet surface to at least one pretreatment selected from pickling, alkaline cleaning and shot blasting, prior to the applying step.

12. A corrosion resistant rare earth magnet comprising a rare earth permanent magnet represented by R-T-M-B wherein R is at least one rare earth element including yttrium, T is iron or a mixture of iron and cobalt, and M is at least one element selected from the group consisting of Ti, Nb, Al, V, Mn, Sn, Ca, Mg, Pb, Sb, Zn, Si, Zr, Cr, Ni, Cu, Ga, Mo, W, and Ta, and the contents of these elements are in the ranges:  $5 \text{ wt\%} \leq R \leq 40 \text{ wt\%}$ ,  $50 \text{ wt\%} \leq T \leq 90 \text{ wt\%}$ ,  $0 \text{ wt\%} \leq M \leq 8 \text{ wt\%}$ , and  $0.2 \text{ wt\%} \leq B \leq 8 \text{ wt\%}$ , and

a composite film of flaky fine powder/alkali silicate glass formed on a surface of said magnet by treating the surface with a treating liquid comprising at least one flaky fine powder selected from the group consisting of Al, Mg, Ca, Zn, Si, Mn, and alloys thereof and an alkali silicate, followed by heating.

13. A corrosion resistant rare earth magnet according to claim 12, wherein said alkali silicate is at least one member selected from the group consisting of lithium silicate, sodium silicate, potassium silicate, ammonium silicate, and mixtures thereof.

14. A corrosion resistant rare earth magnet according to claim 12, wherein said flaky fine powder of which the composite film is made consists of particles of a shape having an average length of 0.1 to 15  $\mu\text{m}$ , an average thickness of 0.01 to 5  $\mu\text{m}$ , and an aspect ratio, given as

average length/average thickness, of at least 2, and the flaky fine powder is present in the composite film in an amount of at least 40 wt%.

- 5 15. A method for preparing a corrosion resistant rare earth magnet, comprising the steps of:

applying a treating liquid comprising at least one flaky fine powder selected from the group consisting of Al, Mg, Ca, Zn, Si, Mn, and alloys thereof and an alkali silicate  
10 to a surface of a rare earth permanent magnet, said rare earth permanent magnet being represented by R-T-M-B wherein R is at least one rare earth element including yttrium, T is iron or a mixture of iron and cobalt, and M is at least one element selected from the group consisting of Ti, Nb, Al, V,  
15 Mn, Sn, Ca, Mg, Pb, Sb, Zn, Si, Zr, Cr, Ni, Cu, Ga, Mo, W, and Ta, and the contents of these elements are in the ranges:  
5 wt%  $\leq$  R  $\leq$  40 wt%, 50 wt%  $\leq$  T  $\leq$  90 wt%, 0 wt%  $\leq$  M  $\leq$  8 wt%, and 0.2 wt%  $\leq$  B  $\leq$  8 wt%, and

heating to form a composite film of flaky fine  
20 powder/alkali silicate glass on the magnet surface.

16. A method for preparing a corrosion resistant rare earth magnet according to claim 15, further comprising the step of subjecting the rare earth permanent magnet surface to  
25 at least one pretreatment selected from pickling, alkaline cleaning and shot blasting, prior to the applying step.